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Comment Received From: Nostromo Energy, Inc.
Submitted On: 4/26/2022
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on Non-Lithium-Ion Long Duration Energy Storage Technologies

Additional submitted attachment is included below.

Email to: docket@energy.ca.gov
Docket Number: 19-ERDD-01
Subject: Nostromo Energy's Comments regarding the Non-Lithium-Ion Long Duration Energy Storage Technologies

Re: Comments of Nostromo Energy Regarding Non-Lithium-Ion Long Duration Energy Storage Technologies

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Introduction

Nostromo Energy, Inc. is the U.S. (Los Angeles based) subsidiary of Israel-based Nostromo Energy Limited, with manufacturing in Anaheim, CA, and is pleased to provide these comments.

Nostromo develops, manufactures and installs a new generation of ice-based, behind the meter, energy storage systems, for storing and supplying the cold energy needs of commercial and industrial customers. The patented system is compact and modular, designed for retrofitting the existing building stock. Target customers include commercial buildings that use chillers for space cooling, such as hotels, shopping centers, office buildings, hospitals, data centers, airports, sports and entertainment facilities, educational facilities as well as industrial customers that use cooling for process (plastics, food and beverage) or space (clean rooms). Space cooling accounts for about half of the electricity requirements of these buildings, and up to 40% of the total load on the grid during peak.

The system is very efficient, flexible and durable. It enables stable and controllable discharging between 2.5 to 10 hours, with 90% round trip efficiency and over 94% depth of discharge. The systems are managed by a cloud-based software, enabling demand side management and aggregation to respond to grid needs, scheduled or on-demand. There are 3 operating sites in Israel and 2 in construction in the Los Angeles area. A 2-year accelerated stress studies simulating service of 20-25 years demonstrated only 1% degradation.

We thank the Commissioners and staff for holding the April 5th workshop on Advancing Non-Lithium-Ion Long Duration Energy and allowing us the opportunity to comment.

Discussion

We ask that the California Energy Commission adopt funding for accelerating commercialization of new non-lithium ion energy storage technologies for Long-Duration that include, and that such funding include not only front of the meter but also **behind the meter** energy storage, as "tools in the toolbox" in addressing California's aggressive RPS, Climate Change, grid resilience, equity and energy storage mandates. We emphasize this point because during the April 5 workshop there was no discussion of behind-the-meter storage technologies, which are critical for accomplishing these goals.

Same as Front of the Meter storage, Behind the Meter storage can capture surplus renewable energy for later use when it is not available. Unlike Front of the Meter storage, Behind the Meter can also shift and otherwise manage demands, all without requiring customers to change behaviors or interfere with their operation. It can do so in an automated fashion, scheduled or on-demand, and aggregated.

Buildings consume about 74% of total electricity, and drive as much as 80% of peak power demand in some regions. About half of its energy consumption is for thermal uses, and the biggest loads are for space cooling, which account for up to 40% of total load on the grid during peak hours. This significant load is both a burden and an opportunity for shifting with Behind the Meter storage.[1]

Indeed, the Lawrence Berkley National Lab, in their *Demand Response Potential Study, Phase 3: Final Report on the Shift Resource Through 2030* (2020) shows that the commercial space cooling represents about a third of the total potential load shift, and almost the entire potential of the commercial sector.

Energy storage in buildings is also a key enabler of "grid interactive energy-efficient buildings" (GEBs), a strategy proposed by the Department of Energy's Building Technology Office, as a critical enabler of decarbonising buildings and the power grid as a whole. According to another LBNL report titled *"A National Roadmap for Grid-Interactive Efficient Buildings* (*Appendices #1*), over the next two decades, national adoption of GEBs could save between $100-200 billion in U.S. electric power system cost savings and reduce 6% of total electricity related carbon emissions.

Further, a fact sheet recently published by the U.S. DOE's Buildings Technology Office recommends installation of active thermal storage systems (TES) for load shifting and system optimization.

Since buildings are the key driver of electricity demand and peak issues, they can also be a part of the solution to load shifting and peak shaving.

Finally, an article published by NREL, Lawrence Livermore National Lab and Oak Ridge National Lab on Energy and Environmental Science on September 14, 2021, titled: *Addressing energy storage needs at lower cost via on-site thermal energy storage in buildings"* (*Appendices #3*) states: "Though Li-ion batteries have many attractive qualities, it is not clear whether they can provide an affordable levelized cost of storage (LCOS) for certain applications, such as buildings. Buildings consume most of the world's electricity, and as much as 50% of their consumption goes toward meeting thermal loads. Buildings are already responsible for more than two-thirds (74%) of electricity consumption in the United States." The article goes on to conclude that "thermal energy storage (TES) can provide a cost-effective alternative to Li-ion

[1] See also U.S. DOE December 2019 report titled *Grid-interactive Efficient Buildings Technical Report Series (Appendices #2)* where 60% of the peak is attributed to four major areas: heating, cooling refrigeration, water heating and ventilation. The Report on page 10 states that one of the proposed solutions is the use of thermal energy storage.

batteries for buildings. Furthermore, that article shows that in many situations, TES can be more cost-effective for buildings than Li-ion batteries."

Cold thermal energy storage (TES) systems is one of a few energy storage options available for large-scale deployment behind the meter to store energy and manage demands. Contrary to the E3 Modeling assertion that thermal energy has approximately 50% Round Trip Efficiency (RTE), Nostromo's RTE is 90%. TES systems generally provide long-duration storage (up to 10 hours or more), in line with the Commission's objectives.

Advantages of Nostromo's solution: Safe, Cost-effective, Job Creation

Nostromo's system is fully recyclable, non-toxic, non-flammable, and non-corrosive—and the ice/water will never degrade over time.

Nostromo system installations in commercial and industrial facilities at scale support the economy at multiple levels and will also promote Job Creation: 10 MWH add approximately 5 full time employees [FTE] in Manufacturing for 1 year.
In addition they add:

- a FTE in project management per year, and
- 4 Construction Jobs per year for the piping work
- 4 Construction Jobs for other construction work

In total, 10 MWH would result in 13 FTE per year.

There are additional indirect impacts from manufacturing of components, Engineering services etc.
1) Assembling ice storage systems in the U.S.
2) Local MEPs, EPCs, and project management firms, specializing in HVAC systems will perform the detailed design, city plan checks and permitting, project execution, and mechanical support services.

Recommendations

New generation thermal energy storage with high efficiency performance are commercially available and are currently being deployed. However, the current pace is slow due to high costs, which would be reduced with volume. The Commission can accelerate deployment and cost reduction by supporting large-scale projects to demonstrate its capabilities and benefits to both the grid and property owners.

For example, a large scale project (multi MW), consisting of multiple sites, aggregated and centrally managed. Project locations can be in areas with distribution congestion, outage risks or other considerations where behind-the-meter storage can have particularly higher value. Such a project can be implemented in less than a year, with measurable success criteria such as reliability, efficiency, deployment time, and more.

Conclusion

Nostromo Energy proposes that the California Energy Commission issues funding programs for accelerating non-lithium-ion long-duration energy storage technologies, including behind-the-meter, distributed, aggregated projects for thermal energy storage in buildings. Novel technologies are both highly efficient and provide long-duration storage, in line with the Commission's goals. We believe such programs would also be well aligned with the strategies adopted by the U.S. Department of Energy for decarbonizing the existing building stock and the grid, by turning buildings into grid assets. Thank you for the opportunity to provide testimony in this proceeding.

Yoram Ashery

Chief Executive Officer

Nostromo Energy, Inc.

APPENDICES

1. Lawrence Berkley Lab, The Department of Energy's report of May 17, 2021, ***"A National Roadmap for Grid-Interactive Efficient Buildings***
https://drive.google.com/file/d/10oda2Qgve5hXjbZyh9_y4TwKDvOFfiut/view

2. US DOE, Office of Energy Efficiency & Renewable Energy, Building Technology Office December 2019 study "***Grid-interactive Efficient Buildings Technical Report Series".***
https://www.energy.gov/eere/buildings/grid-interactive-efficient-buildings
https://www.energy.gov/sites/default/files/2019/04/f62/bto-geb-factsheet-41119.pdf

3. NREL. Lawrence Livermore National Lab and Oak Ridge National Lab published by the Energy and Environmental Science on September 14, 2021, titled: "***Addressing energy storage needs at lower cost via on-site thermal energy storage in buildings"***; "

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